



# Miniaturized Benzene Preconcentrator for Air Quality Monitoring



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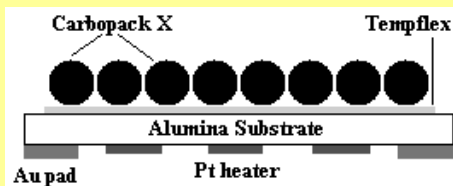
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## Introduction

Nowadays, the monitoring of volatile organic compounds (VOCs) like the Benzene, received a great deal of attention, because it is present in outdoor and indoor environments. As part of the Air Quality Framework Directive of the European Union (Directive 96/62/EC), the "Daughter" Directive (Directive 2000/69/EC) for benzene sets the annual mean limit value at  $5 \mu\text{g m}^{-3}$ , standardised to 293 K and 101.3 kPa

### Process of Fabrication

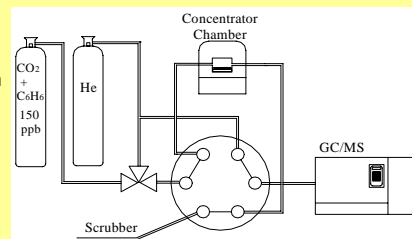
A layer of TEMPFLEX 5145 were deposited on alumina substrates. After this, 2.4 mg de Carbopack X is spread over the surface in order to create the absorbent layer with area of  $\approx 16 \text{ mm}^2$ . In order to functionalize the Carbopack X, an annealing in nitrogen atmosphere at  $300 \text{ }^\circ\text{C}$  for 5 hours was performed.



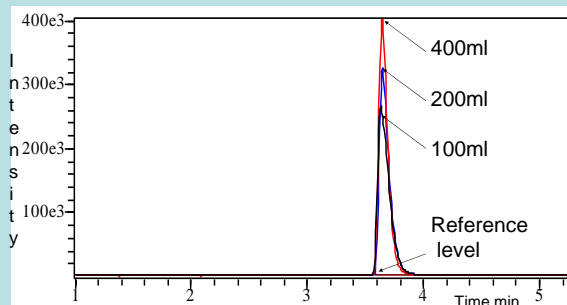
### Measurement System

The measurement process is composed of two steps. First, a monitoring of the bottle concentration was performed by means of five consecutive measurements called blanks.

At the next step, series of three adsorption/desorption processes, using the miniaturized preconcentrator were made. The concentration factor was evaluated using different flows.



## RESULTS



The concentration factor was calculated by comparing the average area peak values obtained from the blank and the desorption

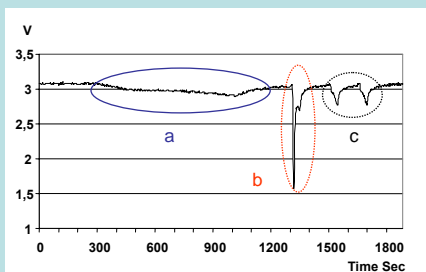
Airflow x 10 mins	Concentration Factor (CF)	CF x area
100 ml	245	16 times x mm <sup>2</sup>
200 ml	265	18 times x mm <sup>2</sup>
400 ml	300	20 times x mm <sup>2</sup>

The average concentration factor (based on 5 preconcentrators) reached 300 times

### Gas Sensor Measurements

Sensor response to:

- a) 500 ppb of C<sub>6</sub>H<sub>6</sub>, without the preconcentrator (normal response)
- b) first desorption
- c) residual desorptions



### Conclusions

- The results obtained with the miniaturized preconcentrators showed high repeatability and pre-concentration factors up to 300 times.
- The small size of the manufactured devices enables their incorporation in an integrated GC- gas sensor system.

